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EXAMINER	
AFTERGUT, JEFF H	

ART UNIT	PAPER NUMBER
1733	

DATE MAILED: 03/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

A9

Office Action Summary	Application No.	Applicant(s)	
	09/725,453	EBERT ET AL.	
	Examiner	Art Unit	
	Jeff H. Aftergut	1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 24-47 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Independent claim 24 recites:

"obtaining an integral fiber preform having at least one intersection or node point, and having a substantially constant material thickness and substantially constant fiber volume content at the at least one intersection or node point and adjoining portions of the preform"

however it is not clear how one obtained the "integral fiber perform" having uniformity in thickness and uniformity in fiber volume along the entire length of the same from one end to the other including nodal points or points of intersection. One skilled in the art would not know how to make the specified perform. The original disclosure at page 4, lines 17-page 5, line 8 that tailored fiber placement was used to make the perform (see also page 7, line 20-page 8, line 6), however the original disclosure recites that the tailored fiber placement entailed the use of sewing thread and stitching repeated layers on top of one another whereby endless fibers were used as the reinforcement. It is not seen how a constant volume (not at least double) and a constant thickness (not at least double) can be obtained by the processing suggested in the original disclosure where continuous, endless fibers were used to make the perform (as conservation of material dictates that at the nodes or points of intersection one skilled in the art

would have expected without removing material that the cross over would have had twice as much material (double thickness) and twice as much endless fiber (twice the fiber volume). As such, the applicant has failed to teach how one skilled in the art would have made the claimed perform such that it would have had the uniformity in fiber volume and thickness including regions of intersection (or nodes).

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 24-47 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 24, line 17, the language "and/or" is present. As applicant has amended the claim elsewhere to recite that the perform must have both constant material thickness and constant fiber volume, the appearance of the language "and/or" on line 17 of the claim is confusing. It is suggested that "and/or" be changed to –and--.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 24, 26-31, 38, 40-45, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deckers et al (newly cited) in view of Kam et al (newly cited) and PCT WO

99/22932 (newly cited) optionally further taken with either one of Kawasaki et al or Blad et al '679 (newly cited).

Deckers et al suggested that it was known at the time the invention was made to form a fiber composite component having at least one intersection or node point which comprised forming a fiber perform by fiber placement which included the steps of laying down a fiber band on a form such that at the nodes one of the bands was cut completely across. This achieved at the nodes a single layer of fiber material (rather than twice the amount at the cross over). While the processing cut the fiber tows at the nodal points to attain the uniformity in thickness and fiber volume (application of the same layer of material at the node as in the remainder of the grid perform would have necessarily attained uniformity in thickness and fiber volume), the reference did cut the fibers (and not employ continuous tows at the nodal points. The applicant is advised that the independent claim does not require continuous fibers be employed in the perform. Additionally, one skilled in the art of manufacturing a grid would have understood that the nodal points were the places where the forces (loads) would have been transferred from one leg of the grid to another and without some form of continuous material would not have facilitated the same. applicant is referred to fiber placement device 1000 and Figure 7 as well as column 8, lines 32-54. the applicant is advised where abutting tows were employed at the nodal points one skilled in the art would have alternated which tows were cut at the node such that forces were capable of being transmitted at the nodal points. The reference suggested that the fiber tows which were placed on the mandrel were provided with resin impregnation therein. The reference additionally suggested that the perform was formed with compressing pieces 24 formed on the mandrel and the whole assembly covered and placed in a mold for the curing of the resin therein.

the perform, however, appears to have been completely formed within the mold and there is no indication that the isogrid would have been formed as a partially cured perform and then disposed in a mold. Additionally, the filament placement operation does not provide for the application of continuous fibers at the nodes to attain a uniformity in fiber volume and thickness there (although the specific abutting operation disclosed would have suggested that one skilled in the art at the time the invention was made would have incorporated uniform thickness and fiber volume even at the nodes).

The reference to Kam et al suggested that one skilled in the art of fabricating a composite structure such as that of Deckers wherein an outer shell was disposed over the isogrid material, would have preformed the complete grid and then molded the same with a preformed shell, see column 1, line 66-column 2, line 23. clearly, one skilled in the art of forming a grid (and in particular an isogrid for an aerospace application) would have understood that the grid assemblies of Deckers would have suitably been formed as a perform and subsequently disposed in a mold for final curing of the resin therein. the combination, nonetheless, failed to teach that those skilled in the art would have employed continuous fibers in the nodal zones wherein the fibers were applied via fiber placement.

PCT '932 suggested that it was known in hand lay up as well as filament wind and tape lay fiber reinforced tape and/or tow which was preimpregnated on a form. The reference expressed that these prior art processes had the disadvantage of not being able to vary the density of material applied such that a complete tape thickness or width be applied in those regions where such was not needed. Such prior art processes according to PCT '932 required that one employ whole numbers of plies in regions where only a half of a ply was needed according to the

composite design parameters of the finished assembly. In order to avoid the necessity of increased material use and increased thickness and to afford one with greater manufacturing flexibility, PCT '932 suggested that one skilled in the art of fiber placement would have controlled the band width by severing and not feeding cut tows which were disposed between adjacent tow which formed the band. As such, one skilled in the art using fiber placement would have been able to vary the density of the fibers being applied to the form as the machine was being operation and without the necessity of completely removing all of the continuous fibers in the band. One viewing PCT '932 faced with the desirability of providing continuous fibers at the nodes in Deckers (rather than completely cutting the tows and abutting the cut ends at the node) would have understood that the use of the fiber placement device of PCT '932 in Deckers would have allowed one to remove half of the tows at the nodal points during laydown and then restart the other half of the tows at the other end of the node and to provide the same processing for the other layer of tow which was fed to the node. Processing in this manner would have resulted in a node which included continuous fibers therein wherein the continuous fibers would have been of an equal number than the non-nodal regions and would have contained equal amounts of continuous fibers from each leg fed into the node (for transmission of load from one leg to another). As such, the volume in the nodal regions as well as the thickness of the resulting node would have been identical to the adjacent regions in the grid assembly. Because it would have afforded one with increased flexibility in the manufacture of the finished assembly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the fiber placement device of PCT '932 in the process of Deckers et al in order to provide for greater flexibility in manufacturing of the grid assembly wherein one skilled in the art would

have provided the grid as a perform assembly prior to final curing of the assembly as suggested by Kam et al as such would have provided one with a uniform grid which was useful for molding and laminating to other layers in composite article manufacture.

With regard to claim 26, note that the references to Deckers and Kam both provided for curing the assembly by the application of heat to the same. regarding claim 27, note that the references to Deckers and Kam both suggested that the fibers would have been preimpregnated with resin in the process. Regarding claim 28, the reference to Deckers suggested the specific molding tooling as defined for formation of the isogrid. Regarding claim 29, the reference to Deckers suggested removal of the molded material from the mold after processing. Regarding claims 30 and 31, the performs as set forth above were all formed from reinforcing fibers which included glass or carbon fibers in a matrix material. regarding claim 38, as addressed above, modification of the fiber placement device of Deckers with the device of PCT '932 would have resulted in a grid assembly which was formed from continuous filamentary material even in the regions of the nodes. Regarding claim 43, note that uniform thickness and uniform volume would have resulted in uniform height in the finished isogrid assembly. Regarding claims 44 and 45, the use of carbon fiber as the reinforcing fiber is taken as conventional fiber material in the fiber placement art wherein one impregnated the same with resin. Use of carbon fiber materials would have been obvious to one of ordinary skill in the art. Note that the references as set forth above all suggested the use of resin impregnated fiber material for the perform for the isogrid. Regarding claim 47, note that the references suggested that one skilled in the art would have employed fiber placement to form the isogrid assembly.

While the reference to Deckers suggested that one skilled in the art would have formed uniform thickness at the nodes, he did not expressly state that the same was desirous or that the same was actually formed. However, in the art of forming grids, it was known at the time the invention was made to form the grids to have a uniformity in thickness as suggested by either one of Kawasaki et al or Blad et al '679. more specifically, Kawasaki et al at column 3, lines 25-29 and Blad et al '679 at the abstract and column 1, lines 65-68, for example, both suggested that those skilled in the art of forming a grid assembly would have desired to provide the same with a uniformity in thickness. While the references did not provide the uniformity in thickness using the fiber placement devices as set forth above, they recognized the desirability of retaining uniformity in the finished assembly of a grid. It would have therefore been obvious to one of ordinary skill in the art at the time the invention was made to provide the grid arrangements of Deckers et al with uniformity in thickness using the specialized fiber placement device of PCT '932 and wherein one formed a perform of the grid before final curing of the same as suggested by Kam as uniformity in thickness was of import in the manufacture of composite grids as suggested by either one of Kawasaki et al or Blad et al '679. See the discussion above with regard to the dependent claims. Regarding claims 40-42, the applicant is advised that the reference to Kawasaki et al suggested that one skilled in the art at the time the invention was made would have incorporated mixed fibers for the reinforcement including organic fibers, polyester fiber, nylon fiber, and glass as well as carbon fibers which may be mixed to form the appropriate blend of fibers, see column 3, lines 39-46.

7. Claims 25, 32, 34-37, and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as set forth above in paragraph 6 further taken with Booth.

The references as set forth above suggested the basic formation of the composite grid assembly wherein the assembly was useful in aerospace and aviation industry, see Deckers et al, column 1, lines 24-33, for example. The references as set forth above, however failed to teach or suggest that one skilled in the art would have subjected the finished grid assembly to pyrolization in order to form a carbon-carbon structure. The reference to Booth suggested that in aviation and aerospace structural members that it was desirable to carbonize the matrix material of the fiber reinforced product in order to make a carbon-carbon composite article. Such provided the structure with the desired matrix in the finished composite article for aerospace and/or aviation applications. As such, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a carbonizing step in the formation of the grid as taught by Booth as such was commonplace in the formation of structural components for aerospace and aeronautical applications wherein one skilled in the art would have desired to produce a stiffer composite structure in the process of making the grid as set forth above in paragraph 6.

With regard to the specific temperatures employed in the densification and graphitization operations claimed (claims 34-37), the applicant is advised that the reference to Booth suggested the specified temperatures. Regarding claims 25, 32, and 46, note that the reference to Booth suggested that one skilled in the art would have pyrolized the assembled composite material and that the reference selected an appropriate matrix for this operation including the use of phenol based resins.

8. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as set forth above in paragraph 6 further taken with any one of Shoesmith et al '627 (newly cited) or Shoesmith et al '306 (newly cited).

While the references as set forth above in paragraph 6 suggested the overall operation where the fibers are laid up on a form via fiber placement, there is no indication that one skilled in the art at the time the invention was made would have formed the grid assembly such that the same was stitched. The applicant is advised, however, that at the nodal points it would have been obvious to provide stitching in order to ensure that the grid assembly stayed together as evidenced by either one of Shoesmith '306 or Shoesmith '627. Applicant is more specifically referred to column 3, line 56-column 4, line 7 of Shoesmith '306 and column 3, line 52-column 4, line 3 of Shoesmith '627. Note that in each of Shoesmith '306 and '627 the references suggested one skilled in the art would have formed a grid arrangement from reinforcing filaments and impregnated the same with a thermosetting resin. In order to better ensure that the crossovers (the nodal points) in the grid arrangement as set forth above in paragraph 6 would have better retained its grid shape and arrangement, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a stitching operation at the cross over as suggested by either one of Shoesmith et al '306 or Shoesmith et al '627 in the process of making a grid as set forth above in paragraph 6.

9. Claims 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as set forth above in paragraph 6 further taken with Handermann (newly cited) or Kent et al (newly cited).

The references as set forth above in paragraph 6 suggested that mixed fibers would have been used mixed fibers for the reinforcing material of the composite article, see Kawasaki et al. to further evidence that those versed in the manufacture of a composite article would have incorporated a mixture of reinforcing filaments and thermoplastic filaments as the fiber

reinforcement in the assembly, the references to Handermann and Kent et al are cited. Both Handermann and Kent et al suggested that those skilled in the art of composite article manufacture would have incorporated a thermoplastic filament in a hybrid yarn which was used as a reinforcement for a fiber reinforced composite article. It should be noted that the incorporation of the thermoplastic filamentary material in the yarn would have acted as a matrix once heated above the melting point of the material and as such would have ensured better penetration of the resin into the fiber reinforcement in the finished assembly. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate a thermoplastic fiber material in the reinforcement in the form of a hybrid yarn as such would have facilitated complete impregnation and better contact of the resin with the fiber reinforcement in the finished assembly as suggested by either on of Kent et al or Handermann in the process of making a fiber reinforced composite grid assembly as suggested above in paragraph 6 (note that the reference to Kawasaki et al suggested that one skilled in the art of grid manufacture would have utilized such a mixed fiber material).

Response to Arguments

10. Applicant's arguments with respect to claims 24-47 have been considered but are moot in view of the new ground(s) of rejection.

Applicant is advised that it is not clear how one achieved the uniformity in fiber volume and uniformity in thickness over the entire grid including the points of intersection as claimed as the disclosure does not express in a clear and concise manner exactly what processing was used to achieve the specified perform. The applicant is advised that as such, there appears to be an enablement problem with the claimed invention.

Regarding the prior art rejection. The applicant is advised that tailored fiber placement as envisioned by PCT '932 and Deckers would have been capable of attaining nodal regions with uniform volume of fiber and common thickness throughout the entire grid arrangement. The applicant is advised, however, that the disclosure does not explain in clear terms what processing is performed and what is meant by "tailored fiber placement" for forming the perform. It would appear that applicant did not cut off some of the fibers to achieve uniform thickness and uniform volume of fiber at the nodal points (as Deckers and PCT '932 would have suggested), however it is not clear exactly what processing was performed at the nodes to achieve the same.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Blad '672 suggested that it was known to form a grid (or isogrid) by fiber placement. Hermann et al and Heath both suggested that uniformity in thickness would have been attained by cutting or grooving out at the nodal points in the grid arrangement.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeff H. Aftergut whose telephone number is 571-272-1212. The examiner can normally be reached on Monday-Friday 7:15-345 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 571-272-1226. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jeff H. Aftergut
Primary Examiner
Art Unit 1733

JHA
March 11, 2004